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EXAMINER	
RILEY, MARCUS T	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/764,579	SAKAMOTO, YOICHI	
	Examiner	Art Unit	
	MARCUS T. RILEY	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *3-5,9-11&15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,6-8,12-14 &16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/19/2004; 04/30/2007; 08/29/2007; 11/13/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 18, 2008 has been entered.

Response to Amendment

2. This office action is responsive to applicant's remarks received on August 21, 2008. **Claims 1-16** remain pending. **Claims 3-5, 9-11 &15** have been cancelled.

Response to Arguments

3. Applicant's arguments with respect to amended **claims 1, 6, 8, 12 & 14** filed on September 18, 2008 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Regarding claims 1, 6, 8, 12 & 14** the word **"means"** is preceded by the word(s) **"output"** in an attempt to use a "means" clause to recite a claim element as a means for performing a specified function.

Regarding claim 7 & 13, the word **"means"** is preceded by the word(s) **"control"** in an attempt to use a "means" clause to recite a claim element as a means for performing a specified function.

Regarding claim 1 & 6, the word **"means"** is preceded by the word(s) **"receiving"** in an attempt to use a "means" clause to recite a claim element as a means for performing a specified function.

However, since no function is specified by the word(s) preceding "means," it is impossible to determine the equivalents of the element, as required by 35 U.S.C. 112, sixth paragraph. See *Ex parte Klumb*, 159 USPQ 694 (Bd. App. 1967).

Claim Rejections - 35 USC § 101

(The previous claim rejection is withdrawn in light of the applicant's amendments.)

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1, 2, 6, 7, 8, 12-14 & 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamoto '457 (US 6,151,457, hereinafter Kawamoto '457) in combination with Lung et al. (US 5,533,175) as applied to claim 1 above, and further in view Horiuchi et al. (US 4,413,275 hereinafter, Horiuchi '275).

Regarding claim 1; Kawamoto '457 discloses a printing system including an information processing apparatus which outputs print data and a printing apparatus which receives the print data from said information processing apparatus wherein said information processing apparatus comprises (See Figure 1where #110 and #120 each include scanner unit, a print engine and a control unit.):

generation means for generating image data for respective printing color components of an image based on data to be print-outputted delivered from higher processing (*"Each image forming apparatus includes an image* ***scanner that scans in an original document so as to generate image data****, an* ***image processing unit for processing the image data****... an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, ...* ***and a printing unit for printing the decoded image data.****"* column 2, line 8-10);

coding means for compress-encoding the quantized image data for the respective printing color components generated by said generation means (*"Each image forming apparatus includes an image scanner that* ***scans in an original document so as to generate image data****... **an encoding unit to encode the processed image data**, an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, **a memory unit for storing the encoded image data received by the interface unit, a decoding unit to decode the encoded image data stored in the memory unit,** and **a printing unit for printing the decoded image data**."* column 2, line 11-12);

plural decoding means, independently provided for the respective printing color components, for decoding coded data stored in the memory areas to image data (*"...an* ***encoding unit***

to encode *the processed image data, an interface unit that* ***transmits the encoded image*** *data and receives image data from other image forming apparatuses, a memory unit for storing the* ***encoded image data*** *received by the interface unit,* ***a decoding unit to decode the encoded image data stored in the memory unit, and a printing unit for printing the decoded image data.*** *"* column 2, lines 8-22);

printing means for printing the image data for respective color components decoded by said plural decoding means on a sheet (*"...an* ***encoding unit to encode*** *the processed image data, an interface unit that* ***transmits the encoded image*** *data and receives image data from other image forming apparatuses, a memory unit for storing the* ***encoded image data*** *received by the interface unit,* ***a decoding unit to decode the encoded image data stored in the memory unit, and a printing unit for printing the decoded image data.*** *"* column 2, lines 8-22);

a reception buffer (*"Additionally, in the present embodiment, a command transfer unit 70-5* ***comprising a transmission buffer and a reception buffer is provided*** *in the image transfer unit 70."* column 8, lines 17-19);

Kawamoto '457 does not expressly discloses generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus; memory allocation means for receiving the memory allocation information notified by said notification means and allocating in accordance with the received memory allocation ratio information, memory areas for respective color components in the reception buffer so that the memory sizes of each memory areas correspond to ratios of the predicted coded data amounts for the respective printing color components; receiving means for, after said memory allocation

means allocates memory areas, receiving coded image data for respective color components and storing the received coded image data of respective color components into respective allocated memory areas.

Lung '175 discloses generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components (*"...object is to **minimize the amount of memory needed on board the printer controller by allocating memory access cycles** between the **processing units within the printer controller** to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is **sent to the printer controller**, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the **optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2** Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth, **some memory bandwidth should be allocated for local CPU and memory** refresh logic."* column 9, lines 11-22); See also(*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer**."* column 6, lines 10-13);

and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus (*" If the **buffered print data is bit map data, then the parser will signal the DMA unit 33**. The DMA unit is responsible for asserting a DMA request signal to the memory arbiter (not shown), and when granted, **generates a memory cycle to move the buffered print data into the raw bit map buffer** The dispatcher generates an **interrupt to the CPU of the controller when a print command is received**. For executing the interrupt routine, the CPU reads in the print command buffered by the host interface. The CPU **determines if the***

***print command is to be executed immediately or be buffered in the print command buffe**r. A print command saved in the print command buffer **will be fetched and executed by the CPU according to the print operation flow**."* column 6, lines 41-55).

memory allocation means for receiving the memory allocation information notified by said notification means and allocating in accordance with the received memory allocation ratio information, memory areas for respective color components in the reception buffer so that the memory sizes of each memory areas correspond to ratios of the predicted coded data amounts for the respective printing color components (*"...object is to **minimize the amount of memory needed on board the printer controller by allocating memory access cycles** between the **processing units within the printer controller** to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is **sent to the printer controller**, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the **optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2** Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth, **some memory bandwidth should be allocated for local CPU and memory** refresh logic."* column 9, lines 11-22); See also (*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer**."* column 6, lines 10-13);

receiving means for, after said memory allocation means allocates memory areas, receiving coded image data for respective color components and storing the received coded image data of respective color components into respective allocated memory areas (*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer**."* column 6, lines 10-13); See also (*" If the **buffered print data is bit map data, then the parser will signal the DMA unit 33**. The DMA unit is responsible for asserting a DMA request signal to the memory arbiter (not shown), and when granted, **generates a memory cycle to move the buffered print data into the raw bit map buffer** The dispatcher generates an **interrupt to the CPU of the controller when a print command is received**.."* column 6, lines 41-52).

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus; memory allocation means for receiving the memory allocation information notified by said notification means and allocating in accordance with the received memory allocation ratio information, memory areas for respective color components in the reception buffer so that the memory sizes of each memory areas correspond to ratios of the predicted coded data amounts for the respective printing color components; receiving means for, after said memory allocation means allocates memory areas, receiving coded image data for respective color components and storing the received coded image data of respective color components into respective allocated memory areas as taught by Lung '175. The motivation for doing so would have been to provide a printer controller that can provide high performance at a low cost (*"An object of the present invention is to provide a printer controller that can provide high performance at a low*

cost." Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 1.

Kawamoto '457 as modified does not expressly disclose printing a color image on a sheet; storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designing a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; notification means for predicting coded data amounts for the respective printing color components based on the table designated by said designation means and the sizes of halftone image areas and character/line image areas included in the respective color components.

Horiuchi '275 discloses printing a color image on a sheet (*"The present invention relates to an* ***ink-jet color printing apparatus for formin****g, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for* ***painting color images having half tones such as a color photograph****.,"* column 1, line 5-9):

storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component (*"****Color density signals of three primary colors for each picture element stored or memorized temporarily in the line buffer memory 37*** *are fed to the UCR circuit 41. Yellow color density signals extracted from the UCR circuit 41 are decoded by a decoder 91 to address a table in a* ***table memory 92 wherein dot patterns to be formed according to color densities are previously stored in the form of combinations of positions of matrix cell*** *and dot signals (according to the voltage with which an ink-jet head is driven)."* column 10, lines 1-10);

designation means for designing a table among the plurality of tables (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be depicted in a dot matrix having n x m, for instance 3x3, possible positions* ***for constructing an image element are determined in accordance with color density signals by referring to a predetermined table****."* column 6, lines 41-46);

and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be* ***depicted in a dot matrix having n x m, for instance 3x3, possible positions for constructing an image element are determined in accordance with color density signals by referring to a predetermined table.*** *Thus the dot pattern generator 45, when a series of yellow color density signals are fed thereto, converts these into three series of yellow color dot signals. In the case of a dot matrix of 4.times.4 possible positions for an image element, a dot pattern generator for producing four series of color dot signals can be employed."* column 6, lines 41-52);

notification means for predicting coded data amounts for the respective printing color components based on the table designated by said designation means and the sizes of halftone image areas and character/line image areas included in the respective color components (*"In the case of* ***printing color images having half-tones and hues such as color photographs****, it is necessary to be able to reproduce picture images with* ***half-tones and hues closely similar to the original in at least sixteen steps of gradations.*** *... In this type of ink-jet head, ink drops are practically limited from 100 to 180.mu. in size so that images with* ***half-tones in sufficient steps of gradation are hardly obtainable.*** *...it has been proposed to vary the number of ink dots appearing on a dot matrix having n possible positions in the row and m possible position in the column (n and m being integers) for one picture element* ***so as to reproduce images with half-tones in a sufficiently large number of steps of gradation****."* column 1, lines 41-57);

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding printing a color image on a sheet; storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designing a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; notification means for predicting coded data amounts for the respective printing color components based on the table designated by said designation means and the sizes of halftone image areas and character/line image areas included in the respective color components; means for setting sizes of said reception buffer allocated for the respective printing color components, in accordance with the memory allocation ratio information as taught by Horiuchi '275. The motivation for doing so would have been to provide an printing apparatus to colored ink-drops from being turbid and flowing (*"The principal object of the present invention is to provide an ink-jet color printing apparatus wherein colored ink drops can be prevented from being turbid and flowing."* Horiuchi '275 at column 2, lines 12-15). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 1.

Regarding claim 2; Kawamoto '457 as modified does not expressly disclose where respective areas of said reception buffer allocated for the respective printing color components are utilized as a ring buffer.

Horiuchi '275 discloses where respective areas of said reception buffer allocated for the respective printing color components are utilized as a ring buffer (*"**Signals of the color** image information read out from the memory device are processed by masking by the use of a non-linear polynomial in a CPU, **being converted***

into color density signals of primary colors, namely, yellow, magenta and cyan. The color density signals masked in a CPU are stored or memorized in four line buffer memories *and are then fed to a UCR circuit by which color density signals of yellow, magenta, cyan and black are generated."* column 2, lines 64-68 thru column 3, lines 1-4).

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding a reception buffer utilized as a ring buffer for printing color components as taught by Horiuchi '275. The motivation for doing so would have been to provide an printing apparatus to prevent colored ink-drops from being turbid and flowing (*"The principal object of the present invention is to provide an ink-jet color printing apparatus wherein colored ink drops can be prevented from being turbid and flowing."* Horiuchi '275 at column 2, lines 12-15). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 1.

Regarding claim 6; Kawamoto '457 discloses a printing system including an information processing apparatus which outputs print data and a printing apparatus which receives the print data from said information processing apparatus wherein said information processing apparatus comprises (See Figure 1where #110 and #120 each include scanner unit, a print engine and a control unit.):

a generation means for generating image data for respective printing color components of an image based on data to be print-outputted delivered from higher processing (*"Each image forming apparatus includes an image* ***scanner that scans in an original document so as to generate image data****, an* ***image processing***

unit for processing the image data*... an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, ...* ***and a printing unit for printing the decoded image data.****." column 2, line 8-10);*

coding means for compress-encoding the quantized image data for the respective printing color components generated by said generation means (*"Each image forming apparatus includes an image scanner that* ***scans in an original document so as to generate image data****... **an encoding unit to encode the processed image data**, an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, **a memory unit for storing the encoded image data received by the interface unit, a decoding unit to decode the encoded image data stored in the memory unit,** and **a printing unit for printing the decoded image data**."* column 2, line 11-12);

a reception buffer (*"Additionally, in the present embodiment, a command transfer unit 70-5* ***comprising a transmission buffer and a reception buffer is provided*** *in the image transfer unit 70."* column 8, lines 17-19);

plural decoding means, independently provided for the respective printing color components, for decoding coded data stored in the memory areas to image data (*"...an* ***encoding unit to encode*** *the processed image data, an interface unit that* ***transmits the encoded image*** *data and receives image data from other image forming apparatuses, a memory unit for storing the* ***encoded image data*** *received by the interface unit,* ***a decoding unit to decode the encoded image data stored in the memory unit, and a printing unit for printing the decoded image data.***" column 2, lines 8-22);

printing means for printing the image data for respective color components decoded by said plural decoding means on a sheet (*"...an* ***encoding unit to encode*** *the processed image data, an interface unit that* ***transmits the encoded image*** *data and receives image data from other image forming apparatuses, a memory unit for storing the* ***encoded image data*** *received by the interface unit,* ***a decoding unit to decode the encoded image data stored in the memory unit, and a printing unit for printing the decoded image data.***" column 2, lines 8-22);

Kawamoto '457 does not expressly disclose generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory

allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus; memory allocation means for receiving the memory allocation information notified by said notification means and allocating in accordance with the received memory allocation ratio information, memory areas for respective color components in the reception buffer so that the memory sizes of each memory areas correspond to ratios of the predicted coded data amounts for the respective printing color components; receiving means for, after said memory allocation means allocates memory areas, receiving coded image data for respective color components and storing the received coded image data of respective color components into respective allocated memory areas.

Lung '175 discloses generating memory allocation ratio information based on a ratio of the calculated coded data amounts for the respective printing color components and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components (*"...object is to* ***minimize the amount of memory needed on board the printer controller by allocating memory access cycles*** *between the* ***processing units within the printer controller*** *to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is* ***sent to the printer controller****, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the* ***optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2*** *Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth,* ***some memory bandwidth should be allocated for local CPU and memory*** *refresh logic."* column 9, lines 11-22);

See also(*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer.**"* column 6, lines 10-13);

output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus (*" If the **buffered print data is bit map data, then the parser will signal the DMA unit 33**. The DMA unit is responsible for asserting a DMA request signal to the memory arbiter (not shown), and when granted, **generates a memory cycle to move the buffered print data into the raw bit map buffer** The dispatcher generates an **interrupt to the CPU of the controller when a print command is received**. For executing the interrupt routine, the CPU reads in the print command buffered by the host interface. The CPU **determines if the print command is to be executed immediately or be buffered in the print command buffe**r. A print command saved in the print command buffer **will be fetched and executed by the CPU according to the print operation flow**."* column 6, lines 41-55).

memory allocation means for receiving the memory allocation information notified by said notification means and allocating in accordance with the received memory allocation ratio information, memory areas for respective color components in the reception buffer so that the memory sizes of each memory areas correspond to ratios of the predicted coded data amounts for the respective printing color components (*"...object is to **minimize the amount of memory needed on board the printer controller by allocating memory access cycles** between the **processing units within the printer controller** to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is **sent to the printer controller**, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the **optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2** Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth, **some memory bandwidth should be allocated for local CPU and memory** refresh logic."* column 9, lines 11-22); See also (*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer.**"* column 6, lines 10-13);

receiving means for, after said memory allocation means allocates memory areas, receiving coded image data for respective color components and storing the received coded image data of respective color components into respective allocated memory areas (*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer**."* column 6, lines 10-13); See also (*" If the **buffered print data is bit map data, then the parser will signal the DMA unit 33**. The DMA unit is responsible for asserting a DMA request signal to the memory arbiter (not shown), and when granted, **generates a memory cycle to move the buffered print data into the raw bit map buffer** The dispatcher generates an **interrupt to the CPU of the controller when a print command is received**.."* column 6, lines 41-52).

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus; memory allocation means for receiving the memory allocation information notified by said notification means and allocating in accordance with the received memory allocation ratio information, memory areas for respective color components in the

reception buffer so that the memory sizes of each memory areas correspond to ratios of the predicted coded data amounts for the respective printing color components; receiving means for, after said memory allocation means allocates memory areas, receiving coded image data for respective color components and storing the received coded image data of respective color components into respective allocated memory areas as taught by Lung '175. The motivation for doing so would have been to provide a printer controller that can provide high performance at a low cost (*"An object of the present invention is to provide a printer controller that can provide high performance at a low cost."* Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 1.

Kawamoto '457 does not expressly disclose printing a color image on a sheet; storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designing a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; notification means for calculating code data amounts for the respective printing color components by counting data amounts of the quantizied halftone image areas and the character/line image areas for the respective printing color components in accordance with the table designated by said designation means.

Horiuchi '275 discloses printing a color image on a sheet (*"The present invention relates to an **ink-jet color printing apparatus for formin**g, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for **painting color images having half tones such as a color photograph**.,"* column 1, line 5-9):

storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component (*"**Color density signals of three primary colors for each picture element stored or memorized temporarily in the line buffer memory 37** are fed to the UCR circuit 41. Yellow color density signals extracted from the UCR circuit 41 are decoded by a decoder 91 to address a table in a **table memory 92 wherein dot patterns to be formed according to color densities are previously stored in the form of combinations of positions of matrix cell** and dot signals (according to the voltage with which an ink-jet head is driven)."* column 10, lines 1-10);

designation means for designing a table among the plurality of tables (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be depicted in a dot matrix having n x m, for instance 3x3, possible positions **for constructing an image element are determined in accordance with color density signals by referring to a predetermined table**."* column 6, lines 41-46);

and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be **depicted in a dot matrix having n x m, for instance 3x3, possible positions for constructing an image element are determined in accordance with color density signals by referring to a predetermined table.** Thus the dot pattern generator 45, when a series of yellow color density signals are fed thereto, converts these into three series of yellow color dot signals. In the case of a dot matrix of 4.times.4 possible positions for an image element, a dot pattern generator for producing four series of color dot signals can be employed."* column 6, lines 41-52);

notification means for calculating code data amounts for the respective printing color components by counting data amounts of the quantizied halftone image areas and the character/line image areas for the respective printing color components in accordance with the table designated by said designation means (*"In the case of **printing color images having half-tones and hues such as color photographs**, it is necessary to be able to reproduce picture images with **half-tones and hues closely similar to the original in at least sixteen steps of gradations.** ... In this type of ink-jet head, ink drops are practically limited from 100 to 180.mu. in size so that images with **half-tones in sufficient steps of gradation are hardly obtainable.** ...it has been proposed to*

vary the number of ink dots appearing on a dot matrix having n possible positions in the row and m possible position in the column (n and m being integers) for one picture element ***so as to reproduce images with half-tones in a sufficiently large number of steps of gradation****."* column 1, lines 41-57);

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding a printing a color image on a sheet; storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designing a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; notification means for calculating code data amounts for the respective printing color components by counting data amounts of the quantizied halftone image areas and the character/line image areas for the respective printing color components in accordance with the table designated by said designation means as taught by Horiuchi '275.The motivation for doing so would have been to provide an printing apparatus to prevent colored ink-drops from being turbid and flowing (*"The principal object of the present invention is to provide an ink-jet color printing apparatus wherein colored ink drops can be prevented from being turbid and flowing."* Horiuchi '275 at column 2, lines 12-15). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 6.

Regarding claim 7; Kawamoto '457 does not expressly disclose wherein said information process apparatus further comprises: request means for requesting status information of said reception buffer from said printing apparatus; determination means for determining whether or not next page compressed data for the respective printing color components can be stored in available areas of the reception buffer for the respective printing color components, based on the status information obtained by said request means; and control means for, if said determination means determines that the next page compressed data can be stored; deleting the memory allocation ratio information to be notified by said notification means and causing said output means to output the next page compressed data.

Lung '175 discloses wherein said information process apparatus further comprises: request means for requesting status information of said reception buffer from said printing apparatus (*"The processing units of this invention, i.e. formatter and serializer,* ***operate by checking status of the buffers, and independently processing data contained in the buffers.....*** *"* column 4, lines 57-60); See also (*"The DMA unit is responsible for asserting a DMA* ***request signal to the memory arbiter (****not shown), and* ***when granted, generates a memory cycle to move the buffered print data into the raw bit map buffer.*** *"* column 6, lines 43-46).;

determination means for determining whether or not next page compressed data for the respective printing color components can be stored in available areas of the reception buffer for the respective printing color components, based on the status information obtained by said request means (*" Print data delivered by the printer driver consists of a sequence of print commands and bit map data, and the dispatcher of the printer controller parses every byte of input data into either bit map data or a print command. For an identified unit of bit map data,* ***the dispatcher requests a memory cycle, and when granted, transfers the bit map data to raw bit map buffer through direct memory access****. For an identified print command, the dispatcher simply generates an interrupt to the*

CPU of the controller. By executing the interrupt routine, the CPU reads in the print command ***and determines if it should be executed immediately or be stored in the print command buffer for later execution.*** *"* column 6, lines 16-27).

and control means for, if said determination means determines that the next page compressed data can be stored (*"The* ***printer controller receives drawing commands*** *from the host computer and converts the commands to bit map data. This conversion is called "Rendering". Typically, data* ***equivalent to one page of information is rendered and stored in a bit map buffer****. This data is read by the engine interface of the controller and serialized* ***before sending out as video signal to the print engine for printing****."* column 1, lines 41-47).

deleting the memory allocation ratio information to be notified by said notification means and causing said output means to output the next page compressed data (*"The* ***dispatching of raw bit map data is suspended when the raw bit map buffer allocated for storing compressed bit map data is full.*** *The optimally coupled data delivery rates for the host interface of the dispatcher and the formatter can minimize the memory size required for buffering the raw bit map data. The formatter translates the raw bit map data into video bit map data, and delivers the video bit map data at a speed required by the serializer.* ***The formatting of video bit map data is suspended when the video bit map buffer is full.*** *The serializer converts the parallel video bit map data to serial video data at the speed that* ***can cope with the printing rate of the majority of laser printer engines, and delivers video data to the marking engine in response to the operation status from the marking engine****.."* column4 , lines 30-47).

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding wherein said information process apparatus further comprises: request means for requesting status information of said reception buffer from said printing apparatus; determination means for determining whether or not next page compressed data for the respective printing color components can be

stored in available areas of the reception buffer for the respective printing color components, based on the status information obtained by said request means; and control means for, if said determination means determines that the next page compressed data can be stored; deleting the memory allocation ratio information to be notified by said notification means and causing said output means to output the next page compressed data as taught by Lung '175. The motivation for doing so would have been to provide a printer controller that can provide high performance at a low cost (*"An object of the present invention is to provide a printer controller that can provide high performance at a low cost."* Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 61.

Regarding claim 8; Kawamoto '457 discloses an information processing apparatus, which is connectable to a printing apparatus in which sizes of reception buffer memory allocated for respective color components are changed in accordance with external instruction information, and which outputs print data to said printing apparatus, comprising (See Figure 1where #110 and #120 each include scanner unit, a print engine and a control unit.): See also (*"Additionally, in the present embodiment, a command transfer unit 70-5* ***comprising a transmission buffer and a reception buffer is provided*** *in the image transfer unit 70."* column 8, lines 17-19);

generation means for generating image data for respective printing color components of an image based on data to be print-outputted delivered from higher processing (*"Each image forming apparatus includes an image* ***scanner that scans in an original document so as to generate image data****, an* ***image processing unit for processing the image data****... an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, ...* ***and a printing unit for printing the decoded image data.****."* column 2, line 8-10);

coding means for compress-encoding the quantized image data for the respective printing color components generated by said generation means (*"Each image forming apparatus includes an image*

scanner that ***scans in an original document so as to generate image data*** *...* ***an encoding unit to encode the processed image data****, an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses,* ***a memory unit for storing the encoded image data received by the interface unit, a decoding unit to decode the encoded image data stored in the memory unit,*** *and* ***a printing unit for printing the decoded image data****."* column 2, line 11-12);

Kawamoto '457 does not expressly disclose generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus.

Lung '175 discloses generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components (*"...object is to* ***minimize the amount of memory needed on board the printer controller by allocating memory access cycles*** *between the* ***processing units within the printer controller*** *to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is* ***sent to the printer controller****, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the* ***optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2*** *Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth,* ***some memory bandwidth should be allocated for local CPU and memory*** *refresh logic."* column 9, lines 11-22); See also(*"...* ***commands are encoded into print commands 296*** *which can be parsed*

by the dispatcher 22. ***Both the print commands*** *and bit strings are* ***assembled by the printer driver 297, and sent to the printer.*** *"* column 6, lines 10-13);

output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus (*" If the* ***buffered print data is bit map data, then the parser will signal the DMA unit 33****. The DMA unit is responsible for asserting a DMA request signal to the memory arbiter (not shown), and when granted,* ***generates a memory cycle to move the buffered print data into the raw bit map buffer*** *The dispatcher generates an* ***interrupt to the CPU of the controller when a print command is received****. For executing the interrupt routine, the CPU reads in the print command buffered by the host interface. The CPU* ***determines if the print command is to be executed immediately or be buffered in the print command buffe****r. A print command saved in the*

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus as taught by Lung '175. The motivation for doing so would have been to provide a printer controller that can provide high performance at a low cost (*"An object of the present*

invention is to provide a printer controller that can provide high performance at a low cost." Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 8.

Kawamoto '457 as modified does not expressly disclose storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designating a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; notification means for predicting coded data amounts for the respective printing color components based on the table designated by said designation means and the sizes of halftone image areas and character/line image areas included in the image to be printed respective printing color components.

Horiuchi '275 discloses storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component (*"**Color density signals of three primary colors for each picture element stored or memorized temporarily in the line buffer memory 37** are fed to the UCR circuit 41. Yellow color density signals extracted from the UCR circuit 41 are decoded by a decoder 91 to address a table in a **table memory 92 wherein dot patterns to be formed according to color densities are previously stored in the form of combinations of positions of matrix cell** and dot signals (according to the voltage with which an ink-jet head is driven)."* column 10, lines 1-10);

designation means for designating a table among the plurality of tables (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be depicted in a dot matrix having n x m, for instance 3x3, possible positions **for constructing an image element are determined in accordance with color density signals by referring to a predetermined table**."* column 6, lines 41-46);

and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be* ***depicted in a dot matrix having n x m, for instance 3x3, possible positions for constructing an image element are determined in accordance with color density signals by referring to a predetermined table.*** *Thus the dot pattern generator 45, when a series of yellow color density signals are fed thereto, converts these into three series of yellow color dot signals. In the case of a dot matrix of 4.times.4 possible positions for an image element, a dot pattern generator for producing four series of color dot signals can be employed."* column 6, lines 41-52);

notification means for predicting coded data amounts for the respective printing color components based on the table designated by said designation means and the sizes of halftone image areas and character/line image areas included in the respective color components (*"In the case of* ***printing color images having half-tones and hues such as color photographs****, it is necessary to be able to reproduce picture images with* ***half-tones and hues closely similar to the original in at least sixteen steps of gradations.*** *... In this type of ink-jet head, ink drops are practically limited from 100 to 180.mu. in size so that images with* ***half-tones in sufficient steps of gradation are hardly obtainable.*** *...it has been proposed to vary the number of ink dots appearing on a dot matrix having n possible positions in the row and m possible position in the column (n and m being integers) for one picture element* ***so as to reproduce images with half-tones in a sufficiently large number of steps of gradation****."* column 1, lines 41-57);

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designating a table among the plurality of tables; and quantizing the generated image data for respective printing

color components using dither matrixes specified by the table designated by said designation means; notification means for predicting coded data amounts for the respective printing color components based on the table designated by said designation means and the sizes of halftone image areas and character/line image areas included in the image to be printed respective printing color components as taught by Horiuchi '275. The motivation for doing so would have been to provide an printing apparatus to prevent colored ink-drops from being turbid and flowing (*"The principal object of the present invention is to provide an ink-jet color printing apparatus wherein colored ink drops can be prevented from being turbid and flowing."* Horiuchi '275 at column 2, lines 12-15). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 8.

Regarding claim 12; Kawamoto '457 discloses an information processing apparatus which is connectable to a printing apparatus in which sizes of reception buffer memory allocated for respective color components are changed in accordance with external instruction information, and which outputs print data to said printing apparatus, comprising(See Figure 1where #110 and #120 each include scanner unit, a print engine and a control unit.); See also (*"Additionally, in the present embodiment, a command transfer unit 70-5* ***comprising a transmission buffer and a reception buffer is provided*** *in the image transfer unit 70."* column 8, lines 17-19):

generation means for generating image data for respective printing color components of an image based on data to be print-outputted delivered from higher processing (*"Each image forming apparatus includes an image* ***scanner that scans in an original document so as to generate image data****, an* ***image processing unit for processing the image data****... an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, ...* ***and a printing unit for printing the decoded image data.****."* column 2, line 8-10);

coding means for compress-encoding the quantized image data for the respective printing color components generated by said generation means (*"Each image forming apparatus includes an image scanner that* ***scans in an original document so as to generate image data*** *...* ***an encoding unit to encode the processed image data****, an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses,* ***a memory unit for storing the encoded image data received by the interface unit, a decoding unit to decode the encoded image data stored in the memory unit,*** *and* ***a printing unit for printing the decoded image data****."* column 2, line 11-12);

Kawamoto '457 does not expressly disclose generating memory allocation ratio information based on a ratio of the calculated coded data amounts for the respective printing color components and said printing apparatus of notifying the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus.

Lung '175 discloses generating memory allocation ratio information based on a ratio of the calculated coded data amounts for the respective printing color components and said printing apparatus of notifying the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components (*"...object is to* ***minimize the amount of memory needed on board the printer controller by allocating memory access cycles*** *between the* ***processing units within the printer controller*** *to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is* ***sent to the printer controller****, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the* ***optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2*** *Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth,* ***some memory bandwidth should be allocated for local CPU and memory*** *refresh logic."* column 9, lines 11-22);

See also(*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer.**"* column 6, lines 10-13);

output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus (*"... the compressed image data can be transferred to other image forming apparatuses such as the digital copy machine 120 via an image transfer unit 70 while **decoding the compressed digital image data so as to output an image based on the decoded digital image data.**"* column 7, lines 16-21); See also (*"...an **encoding unit to encode** the processed image data, an interface unit that **transmits the encoded image** data and receives image data from other image forming apparatuses, a memory unit for storing the **encoded image data** received by the interface unit, **a decoding unit to decode the encoded image data stored in the memory unit, and a printing unit for printing the decoded image data.**"* column 2, lines 8-22);

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus as taught by Lung '175. The motivation for doing so would have been to

provide a printer controller that can provide high performance at a low cost (*"An object of the present invention is to provide a printer controller that can provide high performance at a low cost."* Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 12.

Kawamoto '457 as modified does not expressly disclose storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designating a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; where said notification means for calculating code data amounts for the respective printing color components by counting data amounts of the quantized halftone image areas and character/line image areas for the respective printing color components in accordance with the table designated by said designation means.

Horiuchi '275 discloses storage means for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component (*"**Color density signals of three primary colors for each picture element stored or memorized temporarily in the line buffer memory 37** are fed to the UCR circuit 41. Yellow color density signals extracted from the UCR circuit 41 are decoded by a decoder 91 to address a table in a **table memory 92 wherein dot patterns to be formed according to color densities are previously stored in the form of combinations of positions of matrix cell** and dot signals (according to the voltage with which an ink-jet head is driven)."* column 10, lines 1-10);

designation means for designating a table among the plurality of tables (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be depicted in a dot matrix having n x m, for instance 3x3,*

possible positions ***for constructing an image element are determined in accordance with color density signals by referring to a predetermined table.*** *"* column 6, lines 41-46);

and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be* ***depicted in a dot matrix having n x m, for instance 3x3, possible positions for constructing an image element are determined in accordance with color density signals by referring to a predetermined table.*** *Thus the dot pattern generator 45, when a series of yellow color density signals are fed thereto, converts these into three series of yellow color dot signals. In the case of a dot matrix of 4.times.4 possible positions for an image element, a dot pattern generator for producing four series of color dot signals can be employed."* column 6, lines 41-52);

notification means for calculating code data amounts for the respective printing color components by counting data amounts of the quantized halftone image areas and character/line image areas for the respective printing color components in accordance with the table designated by said designation means (*"In the case of* ***printing color images having half-tones and hues such as color photographs****, it is necessary to be able to reproduce picture images with* ***half-tones and hues closely similar to the original in at least sixteen steps of gradations.*** *... In this type of ink-jet head, ink drops are practically limited from 100 to 180.mu. in size so that images with* ***half-tones in sufficient steps of gradation are hardly obtainable.*** *...it has been proposed to vary the number of ink dots appearing on a dot matrix having n possible positions in the row and m possible position in the column (n and m being integers) for one picture element* ***so as to reproduce images with half-tones in a sufficiently large number of steps of gradation.*** *"* column 1, lines 41-57);

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding storage means

for storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; designation means for designating a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated by said designation means; where said notification means for calculating code data amounts for the respective printing color components by counting data amounts of the quantized halftone image areas and character/line image areas for the respective printing color components in accordance with the table designated by said designation means as taught by Horiuchi '275. The motivation for doing so would have been to provide an printing apparatus to prevent colored ink-drops from being turbid and flowing (*"The principal object of the present invention is to provide an ink-jet color printing apparatus wherein colored ink drops can be prevented from being turbid and flowing."* Horiuchi '275 at column 2, lines 12-15). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 12

Regarding claim 13; Kawamoto '457 as modified does not expressly disclose wherein said information process apparatus further comprises: request means for requesting status information of said reception buffer from said printing apparatus; determination means for determining whether or not next page compressed data for the respective printing color components can be stored in available areas of the reception buffer for the respective printing color components, based on the status information obtained by said request means; and control means for, if said determination means determines that the next page compressed data can be stored; deleting the memory allocation ratio information to be notified by said notification means and causing said output means to output the next page compressed data.

Lung '175 discloses request means for requesting status information of said reception buffer from said printing apparatus (*"The processing units of this invention, i.e. formatter and serializer,* ***operate by checking status of the buffers, and independently processing data contained in the buffers.....*** *"* column 4, lines 57-60); See also (*"The DMA unit is responsible for asserting a DMA* ***request signal to the memory arbiter (****not shown), and* ***when granted, generates a memory cycle to move the buffered print data into the raw bit map buffer****."* column 6, lines 43-46).;

determination means for determining whether or not next page compressed data for the respective printing color components can be stored in available areas of the reception buffer for the respective printing color components, based on the status information obtained by said request means (*" Print data delivered by the printer driver consists of a sequence of print commands and bit map data, and the dispatcher of the printer controller parses every byte of input data into either bit map data or a print command. For an identified unit of bit map data,* ***the dispatcher requests a memory cycle, and when granted, transfers the bit map data to raw bit map buffer through direct memory access****. For an identified print command, the dispatcher simply generates an interrupt to the CPU of the controller. By executing the interrupt routine, the CPU reads in the print command* ***and determines if it should be executed immediately or be stored in the print command buffer for later execution.****"* column 6, lines 16-27).

and control means for, if said determination means determines that the next page compressed data can be stored (*"The* ***printer controller receives drawing commands*** *from the host computer and converts the commands to bit map data. This conversion is called "Rendering". Typically, data* ***equivalent to one page of information is rendered and stored in a bit map buffer****. This data is read by the engine interface of the controller and serialized* ***before sending out as video signal to the print engine for printing****."* column 1, lines 41-47).

deleting the memory allocation ratio information to be notified by said notification means and causing said output means to output the next page compressed data (*"The* ***dispatching of raw bit map data is suspended when the raw bit map buffer allocated for storing compressed bit map data is full.*** *The optimally coupled data delivery rates for the host interface of the dispatcher and the formatter can minimize the memory size required for buffering the raw bit map data. The formatter translates the raw bit map data into video bit map data, and delivers the video bit*

map data at a speed required by the serializer. ***The formatting of video bit map data is suspended when the video bit map buffer is full.*** *The serializer converts the parallel video bit map data to serial video data at the speed that* ***can cope with the printing rate of the majority of laser printer engines, and delivers video data to the marking engine in response to the operation status from the marking engine****.."* column4 , lines 30-47).

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding wherein said information process apparatus further comprises: request means for requesting status information of said reception buffer from said printing apparatus; determination means for determining whether or not next page compressed data for the respective printing color components can be stored in available areas of the reception buffer for the respective printing color components, based on the status information obtained by said request means; and control means for, if said determination means determines that the next page compressed data can be stored; deleting the memory allocation ratio information to be notified by said notification means and causing said output means to output the next page compressed data as taught by Lung '175. The motivation for doing so would have been to provide a printer controller that can provide high performance at a low cost (*"An object of the present invention is to provide a printer controller that can provide high performance at a low cost."* Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 12.

Regarding claim 14; Kawamoto '457 discloses a control method for an information processing apparatus, which is connectable to a printing apparatus in which sizes of reception

buffer memory allocated for respective color components are changed in accordance with external instruction information, and which outputs print data to printing apparatus, said method comprising (See Figure 1where #110 and #120 each include scanner unit, a print engine and a control unit.):; See also (*"Additionally, in the present embodiment, a command transfer unit 70-5* ***comprising a transmission buffer and a reception buffer is provided*** *in the image transfer unit 70."* column 8, lines 17-19);

a generation step of generating image data for respective printing color components of an image based on data to be print-outputted delivered from higher processing (*"Each image forming apparatus includes an image* ***scanner that scans in an original document so as to generate image data****, an* ***image processing unit for processing the image data****... an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses, ...* ***and a printing unit for printing the decoded image data.****."* column 2, line 8-10);

a coding step of compress-encoding the quantized image data for the respective printing color components generated at said generation step (*"Each image forming apparatus includes an image scanner that* ***scans in an original document so as to generate image data****... **an encoding unit to encode the processed image data**, an interface unit that transmits the encoded image data and receives image data from other image forming apparatuses,* ***a memory unit for storing the encoded image data received by the interface unit, a decoding unit to decode the encoded image data stored in the memory unit,*** *and* ***a printing unit for printing the decoded image data****."* column 2, line 11-12);

Kawamoto '457 as modified does not expressly disclose generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus.

Lung '175 discloses generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded at said coding step and notifying the printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components (*"...object is to **minimize the amount of memory needed on board the printer controller by allocating memory access cycles** between the **processing units within the printer controller** to achieve maximum throughput"* column 3, lines 44-47); See also (*"To summarize, if one half megabyte of compressed data is **sent to the printer controller**, the decompressor in the printer controller accesses about 2.5 megabyte of information to decompress the data into one megabyte of video data, and the serializer sends this one megabyte of information, which is about one printed page, to the printer engine. So the **optimum speed allocation and memory bandwidth allocation ratio for this case is: Hr:Dr:Vr=1:5:2** Since the local CPU and memory refresh logic also consume a small portion of memory bandwidth, **some memory bandwidth should be allocated for local CPU and memory** refresh logic."* column 9, lines 11-22); See also(*"... **commands are encoded into print commands 296** which can be parsed by the dispatcher 22. **Both the print commands** and bit strings are **assembled by the printer driver 297, and sent to the printer**."* column 6, lines 10-13);

output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus (*" If the **buffered print data is bit map data, then the parser will signal the DMA unit 33**. The DMA unit is responsible for asserting a DMA request signal to the memory arbiter (not shown), and when granted, **generates a memory cycle to move the buffered print data into the raw bit map buffer** The dispatcher generates an **interrupt to the CPU of the controller when a print command is received**. For executing the interrupt routine, the CPU reads in the print command buffered by the host interface. The CPU **determines if the print command is to be executed immediately or be buffered in the print command buffe**r. A print command saved in the print command buffer **will be fetched and executed by the CPU according to the print operation flow**."* column 6, lines 41-55).

Kawamoto '457 and Lung '175 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates generally to computerized printing systems and methods..."* Lung '175 at column 1, lines 6-7).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding generating memory allocation ratio information based on a ratio of the predicted coded data amounts for the respective printing color components coded by said coding means and notifying said printing apparatus of the memory allocation ratio information so that said printing apparatus allocates memory areas for respective color components; and output means for, after said notification means notifies said printing apparatus of the memory allocation ratio information outputting the coded image data of the respective printing color components coded by said coding means to said printing apparatus as taught by Lung '175. The motivation for doing so would have been to provide a printer controller that can provide high performance at a low cost (*"An object of the present invention is to provide a printer controller that can provide high performance at a low cost."* Lung '175 at column 3, lines 21-22). Therefore, it would have been obvious to combine Kawamoto '457 with Lung '175 to obtain the invention as specified in claim 14.

Kawamoto '457 as modified does not expressly discloses a storing step of storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; a designation step of designating a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated in said designation step; a notification step of predicting coded data amounts for the respective printing color components

based on the table designated in said designation step and the sizes of halftone image areas and character/line image areas included in the image to be printed.

Horiuchi '275 discloses a storing step of storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component (*"**Color density signals of three primary colors for each picture element stored or memorized temporarily in the line buffer memory 37** are fed to the UCR circuit 41. Yellow color density signals extracted from the UCR circuit 41 are decoded by a decoder 91 to address a table in a **table memory 92 wherein dot patterns to be formed according to color densities are previously stored in the form of combinations of positions of matrix cell** and dot signals (according to the voltage with which an ink-jet head is driven)."* column 10, lines 1-10);

a designation step of designating a table among the plurality of tables (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be depicted in a dot matrix having n x m, for instance 3x3, possible positions **for constructing an image element are determined in accordance with color density signals by referring to a predetermined table**."* column 6, lines 41-46);

and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated in said designation step (*"In each of the dot pattern generators 45 to 48, the locations and sizes of the ink dots to be **depicted in a dot matrix having n x m, for instance 3x3, possible positions for constructing an image element are determined in accordance with color density signals by referring to a predetermined table.** Thus the dot pattern generator 45, when a series of yellow color density signals are fed thereto, converts these into three series of yellow color dot signals. In the case of a dot matrix of 4.times.4 possible positions for an image element, a dot pattern generator for producing four series of color dot signals can be employed."* column 6, lines 41-52);

a notification step of predicting coded data amounts for the respective printing color components based on the table designated in said designation step and the sizes of halftone image areas and character/line image areas included in the image to be printed (*"In the case of **printing color images having half-tones and hues such as color photographs**, it is necessary to be able to reproduce picture images with **half-tones and hues closely similar to the original in at least sixteen steps of gradations.** ... In this type of ink-jet head, ink*

drops are practically limited from 100 to 180.mu. in size so that images with ***half-tones in sufficient steps of gradation are hardly obtainable.*** *...it has been proposed to vary the number of ink dots appearing on a dot matrix having n possible positions in the row and m possible position in the column (n and m being integers) for one picture element* ***so as to reproduce images with half-tones in a sufficiently large number of steps of gradation****."* column 1, lines 41-57);

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding a storing step of storing a plurality of tables for defining a set of dither matrix patterns used for character/line image and halftone image for each color component; a designation step of designating a table among the plurality of tables; and quantizing the generated image data for respective printing color components using dither matrixes specified by the table designated in said designation step; a notification step of predicting coded data amounts for the respective printing color components based on the table designated in said designation step and the sizes of halftone image areas and character/line image areas included in the image to be printed as taught by Horiuchi '275. The motivation for doing so would have been to provide an printing apparatus to prevent colored ink-drops from being turbid and flowing (*"The principal object of the present invention is to provide an ink-jet color printing apparatus wherein colored ink drops can be prevented from being turbid and flowing."* Horiuchi '275 at column 2, lines 12-15). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 14.

Regarding claim 16; Kawamoto '457 as modified does not expressly discloses a computer-readable medium that stores a computer program for causing a computer to implement the method.

Horiuchi '275 discloses a computer-readable medium that stores a computer program for causing a computer to implement the method (*"A conventional* ***mini-computer can be employed as the CPU described above for controlling the color image information*** *input unit 1 and printer 3, for controlling the* ***memorizing or reading out of the color image information, and for carrying out the various image processings.***" column 5, lines 30-35).

Kawamoto '457 and Horiuchi '275 are combinable because they are from same field of endeavor of printing systems (*"The present invention relates to an ink-jet color printing apparatus for forming, that is, painting color images with several kinds of colored inks and more particularly to an apparatus which is suitable for painting color images having half tones such as a color photograph."* Horiuchi '275 at column 1, lines 5-9).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printing apparatus as taught by Kawamoto '457 by adding a computer-readable medium that stores a computer program for causing a computer to implement the method as taught by Horiuchi '275. The motivation for doing so would have been to provide a printing apparatus which is simple in structure and which does not need a large scale time delaying circuit. (*"A further object of the present invention is to provide an ink-jet color printing apparatus which is simple in structure and which does not need a large scale time delaying circuit."* Horiuchi '275 at column 2, lines 16-19). Therefore, it would have been obvious to combine Kawamoto '457 with Horiuchi '275 to obtain the invention as specified in claim 14.

Examiner Notes

8. The Examiner cites particular columns and line numbers in the references as applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested that, in preparing responses, the applicant fully considers the references in its entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or as disclosed by the Examiner.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARCUS T. RILEY whose telephone number is (571)270-1581. The examiner can normally be reached on Monday - Friday, 7:30-5:00, est.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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